Claims

What is claimed is:

1. A method of forming pigment pseudoparticles from pigment particles, comprising:

polarizing pigment particles with a gas; and

agglomerating the polarized pigment particles to form pigment pseudoparticles.

2. The method of claim 1, wherein polarizing the pigment particles comprises polarizing titanium dioxide particles, and wherein agglomerating comprises agglomerating the polarized titanium dioxide particles.

3. The method of claim 1, wherein polarizing comprises dispersing the pigment particles in the gas.

4. The method of claim 1, wherein polarizing the pigment particles comprises inducing an at least temporary dipole in each of the pigment particles.

5. The method of claim 1, wherein polarizing comprises polarizing enough molecules of each of the pigment particles to induce heightened van der Waal bonding between the pigment particles.

6. The method of claim 5, wherein polarizing the pigment particles comprises polarizing less than all molecules of the pigment particles.

7. The method of claim 1, comprising charging at least a portion of the pigment particles with the gas.

8. The method of claim 1, comprising passing the pigment particles through the gas.

9. The method of claim 8, wherein passing comprises providing a draft of air passing through the pigment particles.

10. The method of claim 8, comprising carrying away excess heat in the flow.

11. The method of claim 8, comprising carrying away no more than a negligible amount of pigment particles in the flow.

12. The method of claim 1, wherein agglomerating comprises depositing a portion of the polarized pigment particles upon a pile of the polarized pigment particles having an angle of inclination greater than the angle of repose of the pile.

13. The method of claim 1, wherein agglomerating comprises agglomerating the polarized pigment particles into substantially-spherically shaped pigment pseudoparticles.

14. The method of claim 1, wherein agglomerating comprises agglomerating the polarized pigment particles into substantially-spherically shaped pigment pseudoparticles each having a diameter between about 0.1 millimeter and about 5.0 millimeters.

15. The method of claim 1, wherein agglomerating comprises nucleating.

16. The method of claim 1, comprising deaerating the pigment particles.

17. The method of claim 1, wherein agglomerating comprises axially rotating a hollow vessel with an inner cylindrical surface containing the polarized pigment particles, thereby inducing repeated avalanching of the polarized pigment particles.

18. The method of claim 17, comprising vibrating an inlet feed of the hollow vessel to deaerate the pigment particles.

19. The method of claim 18, wherein vibrating comprises vibrating the inlet feed at a frequency of vibration between about sixty vibrations per minute and about twenty-thousand vibrations per minute.

20 The method of claim 17, comprising vibrating the hollow vessel to mitigate adhesion between the inner cylindrical surface and at least one of the pigment particles and the polarized pigment particles.

21. The method of claim 1, wherein the method is conducted under an electrically isolated condition.

22. The method of claim 1, wherein the method is conducted at temperatures between about 0 degrees Celsius and about 100 degrees Celsius.

23. The method of claim 1, wherein the method is conducted for a duration of time between about 0.25 minutes and about 15 minutes.

24. The method of claim 1, comprising post-treating the pigment pseudoparticles.

25. The method of claim 24, wherein post-treating comprises applying a layer of chemical additive to the surface of the pigment pseudoparticles.

26. The pigment pseudoparticles produced in accordance with the method of claim 1.

27. Paint formulation comprising the pigment pseudoparticles produced in accordance with the method of claim 1.

28. Masterbatch comprising the pigment pseudoparticles produced according to the method of claim 1.

29. A method of forming pigment pseudoparticles from titanium dioxide particles, comprising:

providing a hollow vessel having an inner cylindrical surface and containing pigment particles;

providing a plurality of paddles that extend inwardly from the inner cylindrical surface;

passing a flow of gas through the inner cylindrical surface;

axially rotating the inner cylindrical surface, thereby causing the plurality of paddles to lift a portion of the pigment particles;

axially rotating the inner cylindrical surface, thereby causing the plurality of paddles to dispense the pigment particles of the dispensed portion being polarized by the gas and landing onto a pile of the pigment particles; and

axially rotating the inner cylindrical surface, thereby inducing a repeated avalanching of the polarized pigment particles that agglomerates the polarized pigment particles into pigment pseudoparticles.

30. The method of claim 29, wherein providing the plurality of paddles comprises providing the plurality of paddles positioned along in the inner cylindrical surface in a substantially helical formation.

31. The method of claim 29, comprising vibrating an inlet feed of the hollow vessel to deaerate the pigment particles.

32. The pigment pseudoparticles produced in accordance with the method of claim 29.

33. A pigment pseudoparticle comprising pigment particles bonded together primarily by an induced level of intermolecular electrostatic attractive force, the pseudoparticle being substantially free of dust.

34. A pigment pseudoparticle consisting essentially of pigment particles bonded together by an induced level of intermolecular electrostatic attractive force.

35. A post-treated pigment pseudoparticle, comprising:

a pigment pseudoparticle consisting essentially of pigment particles bonded together by an induced level of intermolecular electrostatic attractive force;

wherein at least part of a surface of the pigment pseudoparticle is post-treated with chemicals.

36. A method of forming pigment pseudoparticles from pigment particles, comprising:

providing an inclined hollow vessel having an inner cylindrical surface, a higher inlet end and a lower outlet end;

providing a plurality of paddles extending inwardly from the inner cylindrical inner surface and positioned along the axial length of the inclined hollow vessel in a helical formation;

introducing the pigment particles into the inclined hollow vessel at the higher inlet end;

passing a flow of gas through the inclined hollow vessel in a direction toward the lower outlet end;

lifting the pigment particle with the paddles by axially rotating the cylindrical inner surface;

dispensing the pigment particles from the paddles by axially rotating the cylindrical inner surface, thereby allowing the pigment particles to fall through the flow towards a portion of the inner cylindrical surface nearer the outlet end while being polarized by the gas; and

nucleating the polarized pigment particles into pigment pseudoparticles by axially rotating the inner cylindrical surface.

37. The pigment pseudoparticles produced in accordance with the method of claim 36.

38. An apparatus for forming pigment pseudoparticles from pigment particles, comprising:

means for polarizing the pigment particles with a gas; and

means for agglomerating the polarized pigment particles into pigment pseudoparticles.

39. The apparatus of claim 38, comprising means for deaerating the pigment particles.

40. The apparatus of claim 38, comprising means for minimizing adhesion between the inner cylindrical surface and at least one of the pigment particles and the polarized pigment particles.

41. An apparatus for forming pigment pseudoparticles from pigment particles, comprising:

a hollow vessel comprising an inner cylindrical surface, an inlet end, and an outlet end, wherein the hollow vessel is adapted to be positioned in at an incline having the inlet end higher and the outlet end lower;

a gas within the hollow vessel; and

a plurality of scoops extending inwardly from the inner cylindrical surface and positioned along the axial length of the inner cylindrical surface.

42. The apparatus of claim 41, wherein the gas comprises a draft of air flowing in a direction from the inlet end towards the outlet end.

43. The apparatus of claim 41, comprising vibrating means for deaerating the pigment particles.

44. An apparatus for inducing electrostatic bonding and agglomeration of pigment particles:

a hollow vessel adapted to be rotated in an axial direction and having an inner cylindrical surface for containing the pigment particles;

a plurality of paddles, each of the plurality of paddles comprising an attachment end attached to the inner cylindrical surface, a dispenser end distal the attachment end, and a segment of paddle between the attachment end and the dispenser end, wherein the segment has concave curvature facing the axial direction;

a gas within the hollow vessel; and

a means for driving rotation of the hollow vessel.

45. The apparatus of claim 44, wherein the attachment end is at least one of being directly attached to the inner cylindrical surface and being attached to the inner cylindrical surface via an intermediate component.

46. The apparatus of claim 44, wherein the hollow cylindrical hollow vessel is modular.

47. The apparatus of claim 44, comprising means for supporting the hollow vessel during rotation.

48. The apparatus of claim 44, wherein the means for supporting the hollow vessel comprises trunnions.

49. The apparatus of claim 44, wherein each of the plurality of paddles are spoon-shaped.

50. The apparatus of claim 44, wherein a radius of curvature of the segment is substantially equal to a linear distance measured from the attachment end to the dispenser end.

51. The apparatus of claim 50, wherein the dispenser end comprises convex curvature having a radius of curvature substantially equal to half the width of the segment.

52. The apparatus of claim 44, comprising means for deaerating the pigment particles.

53. The apparatus of claim 44, comprising means for minimizing adhesion between the inner cylindrical surface and at least one of the pigment particles and the polarized pigment particles.

54. The apparatus of claim 53, wherein the means for minimizing adhesion comprises strikers adapted to strike the hollow vessel thereby causing the hollow vessel to vibrate.

55. The apparatus of claim 54, comprising means for periodically actuating the strikers in association with rotation of the hollow vessel.

56. The apparatus of claim 44, wherein the hollow incline is positioned at an angle with respect to the ground.

57. The apparatus of claim 44, comprising an inlet for receiving the pigment particles and an outlet for discharging agglomerated pigment particles.

58. The apparatus of claim 57, wherein the hollow incline is positioned at an angle with respect to the ground, the inlet being higher than the outlet.

59. The apparatus of claim 58, wherein the angle is no more than about twenty degrees.

60. The apparatus of claim 58, wherein the angle is greater than about zero degrees and wherein the angle is less than about ten degrees.

61. The apparatus of claim 44, wherein the attachment ends of the plurality of paddles are positioned along the inner cylindrical surface in a substantially helical formation.

62. The apparatus of claim 44, wherein the plurality of paddles comprise at least one set of paddles, the attachment ends of each paddle in a set being positioned along the inner cylindrical surface in a substantially helical formation.

63. The apparatus of claim 44, wherein the plurality of paddles comprises a first set of paddles, a second set of paddles and a third set of paddles, wherein the attachment ends of each paddle in the first set are positioned along the inner cylindrical surface in a first substantially helical formation, wherein the attachment ends of each paddle in the second set are positioned along the inner cylindrical surface in a second substantially helical formation, and wherein the attachment ends of each paddle in the third set are positioned along the inner cylindrical surface in a third substantially helical formation.